Navigating the Interconnection

Randall L. West
Director of New Product Development
March 21, 2003

Introduction to Encorp

ENCORP VISION STATEMENT

To be recognized as the world's leading provider of network technology and infrastructure-management solutions for the distributed energy market.

ENCORP MISSION STATEMENT

To develop and implement real-time, distributed energy-focused solutions for a wide range of applications through innovative products and services, which are technology-neutral, easily networked, supported 24/7 and deliver high-level, enterprise-wide functionality for our clients' growing needs.

WHAT DO WE DO?

We develop and market software and hardware technology solutions for the communication, control, and networking of distributed energy.

Introduction to Encorp

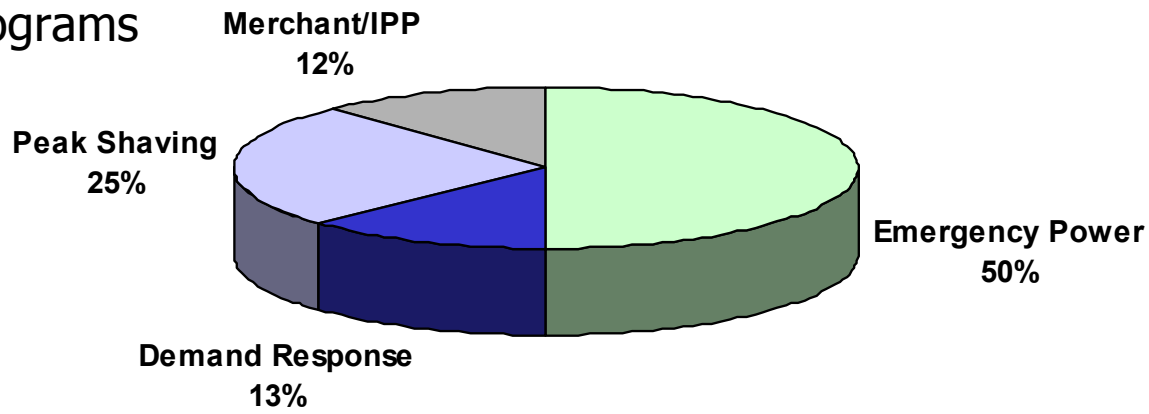
- Leading Provider of "*Technology-Neutral*" Grid Interconnection, Network Integration, & Control Solutions for the Distributed Resources Market

- Uniquely positioned in rapidly growing Power Quality, Reliability, & Load Management Segments

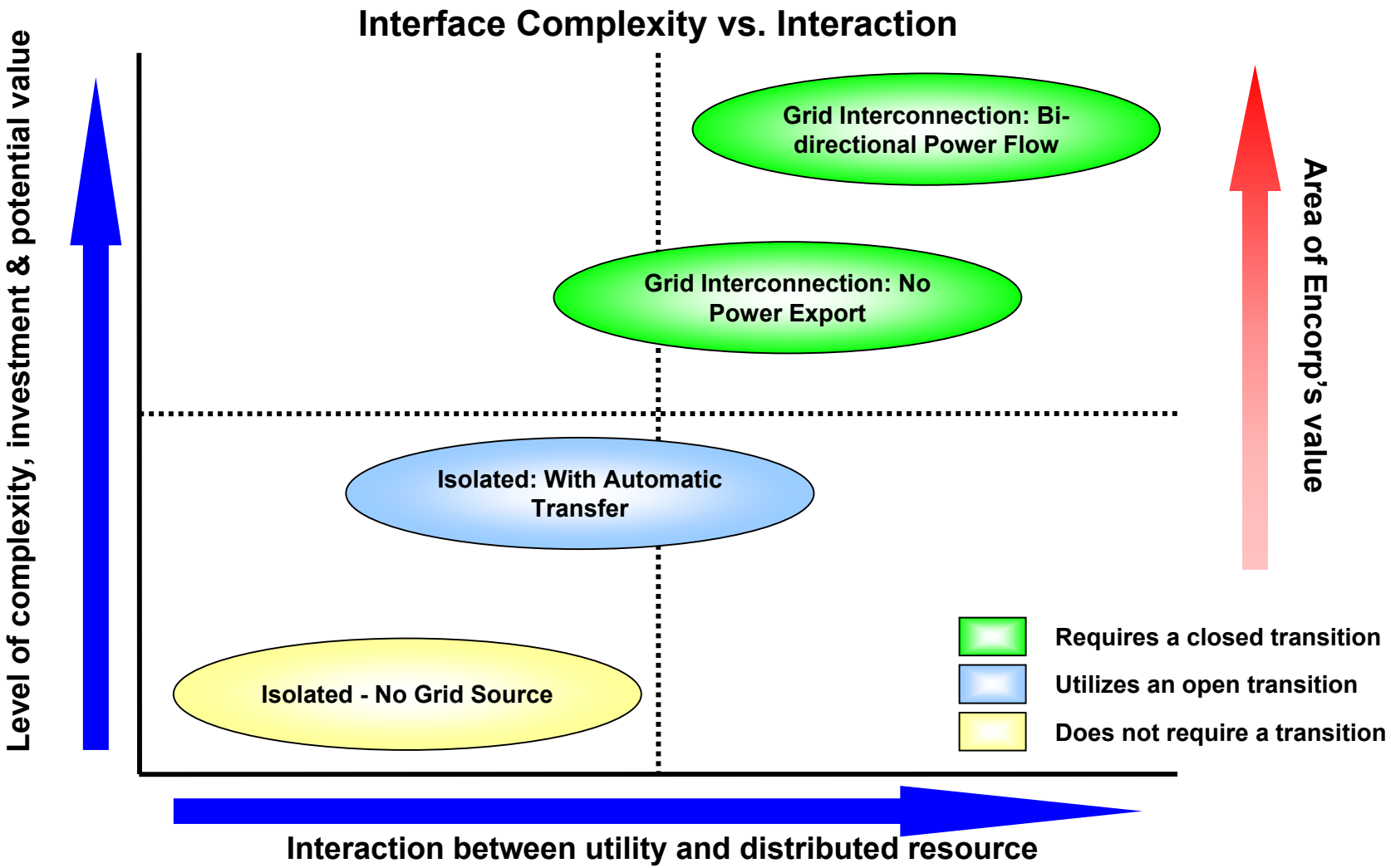
- Sustainable Competitive Advantages
  - Proprietary, technology-based "first-mover"
  - Broad project solutions experience
  - Excellent reputation within the distributed energy resources (DER) sector
  - Demonstrated compatibility across wide range of third-party equipment & systems

Encorp by the Numbers

- Total MW controlled by Encorp 500+
- Number of Generator Power Controllers (GPC's) shipped (as of 01/08/02) 1,319
- Total number of customers 127
- Breakdown of projects by application
  - Emergency power
  - Peak shaving
  - Merchant/IPP
  - Demand response programs
    - Interruptible rates
    - Time of use rates
    - Peak sharing



Interface Technologies Positioning



Source: Arthur D. Little & Encorp

Recognizing DER Value

Electricity End-User

- ✓ **Lower total energy costs – integrate chiller, boiler, manufacturing, and electricity needs in a unified system for higher efficiencies**
- ✓ **Critical loads – eliminate utility outage costs**
- ✓ **Secure power – critical energy customers**

Energy Delivery Firms

- ✓ **Minimize peak demand costs – partner with DER**
- ✓ **Relieve transmission bottlenecks**
- ✓ **Voltage support – where it is needed**

Grid Interconnection

There are 3 main areas for grid interconnection that should be reviewed:

#1	**Regulatory**
#2	**Contractual / Tariffs**
#3	**Business practices**

Stakeholder Structure

Institutions, whether they are utilities, trade associations or regulators act with considered deliberation.

- ✓ **Primary technical focus is being addressed via the IEEE and US DOE.**
- ✓ **Wholesale market rule making is being driven by US FERC whose role has expanded to RTO / ISO & demand response governance.**
- ✓ **Retail tariff and interconnection creation & enforcement occurs at the state PUC level.**
  - ✓ **Distributed energy resource (DER) tariffs to capture potential value of DER as part of the energy supply mix (ancillary benefits, wholesale values, fuel price adjustment mechanisms, net metering)**

Numerous Regulatory Stakeholders

Currently there are a number of regulatory issues being discussed by multiple stakeholders today.

Key Issues
✓ **Safety – what protective devices are necessary?**
✓ **Cost effective standards – who pays? How are costs shared between developers & utilities?**
✓ **Reliability**
✓ **User-friendly interconnection interfaces**
✓ **Interconnection between multiple DER units**
✓ **Communication & control protocols and governance**

Future Regulatory Challenges

As the key issues are addressed, new challenges will emerge.

Future Issues
✓ Can microgrids be utilized effectively?
✓ Can engineering studies be eliminated, standardized or streamlined?
✓ Is there a limit to the level of DER that a utility system can absorb?
✓ What are the limitations of bi-directional power flows?
✓ What are the informational needs of energy delivery firms with DER deployed in their system?
✓ Can interconnection devices be modular & scalable?

Contractual / Tariffs

How can end-users and energy delivery firms fairly share the costs and capture the maximum benefits from DER?

Key Issues
✓ Standby service charges
✓ Departing load charges (i.e. exit fees)
✓ Regulatory uncertainty (i.e. California)
✓ Rate class degradation
✓ Lack of incentives for utility cost reduction
✓ Lack of the ability to create experimental tariffs
✓ Early stage demand response marketplace
✓ Lack of performance-based rate making – value oriented tariffs

Changes in Tariff Structures

A portion of DER savings are lost to standby charges.

Illustrative

	Annual Costs of Electricity Purchased from Utility				
	Peak Demand (kW)	Demand Charges	Purchased Energy (kWh)	Energy Charges	Total Cost
Without DER Equipment	75-96	$7,810	439,000	$17,480	$25,290
With 50kW Micro-turbine	25-46	$2,740	359,700	$13,335	$16,075
Annual Savings in Electricity Purchased		$5,070		$4,145	$9,215

Standby Charges Directly Impact DER's Value to Consumers

DER operating costs	$3,605
Standby service	$5,220
Total savings	$390

Source: Arthur D. Little

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Standby Charges Directly Impact DER's Value to Consumers

DER operating costs	$3,605
Standby service	$0
Total savings	$5,610

Source: Arthur D. Little

Business Practices

Issue #1	**Contractual – less obvious but real barrier. It often takes 5 – 9 months to gain interconnection approval**
Issue #2	**Procedural – Has to do with people, bureaucracies, hidden costs via meetings, delays & paperwork**

Contractual

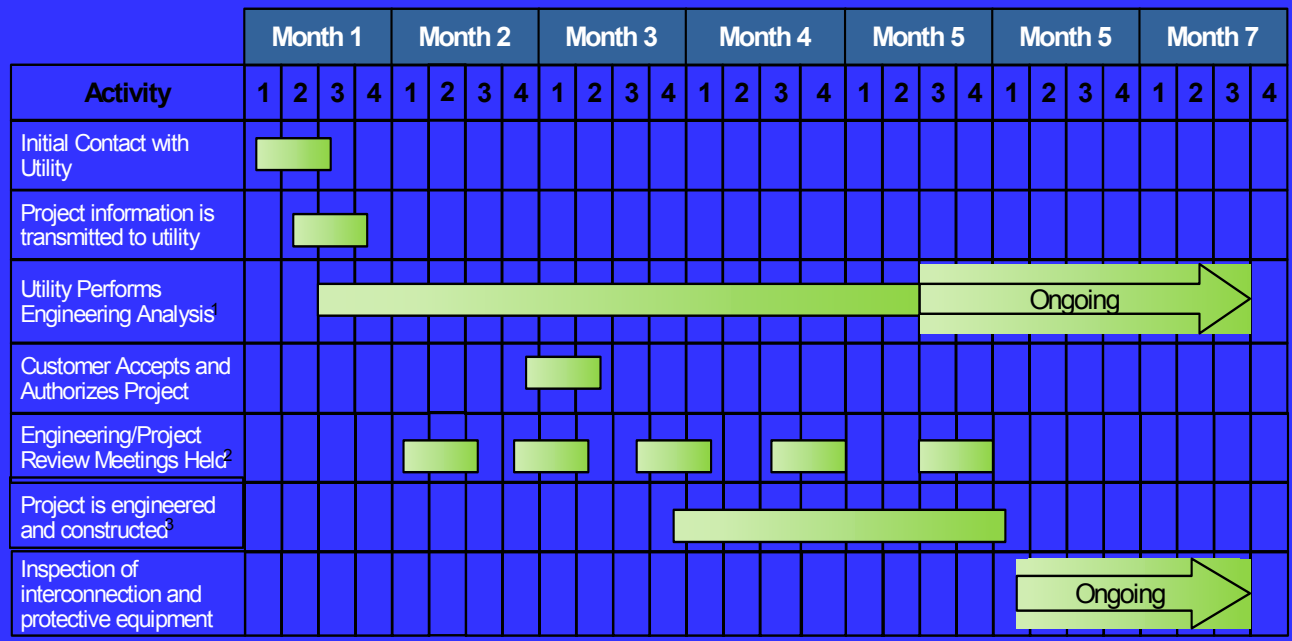
Contractual issues that come up with some utilities:

- ✓ **Prohibitions against interconnection**
- ✓ **Lack of contact people or leaders to assist customers with interconnection**
- ✓ **High application & interconnection fees**
- ✓ **Insurance & indemnification requirements**
- ✓ **Utility operational requirements**
- ✓ **Final interconnection requirements & procedures**

Source: NREL

Procedural & Contractual Timeline

The typical interconnection approval process can be lengthy and complex.



Note: All times are approximate and can vary widely by size of project, location of project, configuration of project, and host utility.

1. Engineering analysis may take up to one year depending on DG technology, installation size, and installation location.
2. Meetings are held intermittently and depends on several factors.
3. Project engineering and inspection may take as little as three months or as long as one year.

Source: Arthur D. Little

Utility Evolution to Competitive Market Business Models

Many utilities are exploring new business models

- ✓ **T&D support & capital deferral**
- ✓ **Load pockets**
- ✓ **Peak capacity**
- ✓ **Peak sharing on the customer side of the meter**
- ✓ **Demand response programs (could be aligned with with peak capacity programs)**
- ✓ **Economic arbitrage (electric only, or gas/electric spark spread)**
- ✓ **Utility ownership of customer-sited DER for emergency backup & the range of measures noted above**

All of these require utilities to be their own customer or the customer of other energy delivery companies.

The Future Has Arrived

Other industrialized countries and developing nations are further along the interconnection path than in North America.

- ✓ **CHP / Cogen & renewable energy has broad acceptance in the Netherlands, Sweden & elsewhere**
  - ✓ **Demonstrate a penchant for technology savvy, adopting networked IT & a focus on environmental sustainability & efficiency**
- ✓ **Developing nations have an immediate need for power without the same level incumbent energy infrastructure & bureaucracies**
  - ✓ **DER is a "leap-frog" technology in regions without adequate pipes & wires. Analogous to skipping over copper to wireless infrastructure**

What Comes Next?

Increased distributed network flexibility, scalability & robustness

- ✓ **Market demands multiple applications addressed by a single interconnection system (i.e. demand response meets CHP meets real time pricing)**
- ✓ **The grid is not going away and energy delivery firms will remain central DER stakeholders**
- ✓ **Federal regulators & legislators may increase their involvement once DER is viewed as valuable to:**
  - ✓ **Energy independence**
  - ✓ **Grid security**
  - ✓ **Environmentally sustainable**
  - ✓ **Energy efficiency**
- ✓ **End-User and Energy Delivery Firms are Benefiting from**
  - ✓ **California Rule 21 – Standardized, tiered approach based upon impact**
  - ✓ **P1547 – Providing a national standard**
  - ✓ **Incentives for CHP projects – the end-user can harness the byproduct energy produced during electrical generation.**

Thank You